



SECTION- I: PROJECT DESCRIPTION

1.1 BACKGROUND

POWERGRID, the Central Transmission Utility (CTU) of the country is engaged in power transmission with the mandate for planning, co-ordination, supervision and control over complete inter-State transmission system. As on 31st May'13, POWERGRID has established about 1,01,334 ckt kms of transmission lines at 765 KV, 400 KV, 220 KV & 132 KV EHVAC & +500 KV HVDC levels and 168 sub-stations with transformation capacity of about 1,64,813 MVA. This transmission network, spread over length and breadth of the country, is consistently maintained at an availability of over 99% through deployment of state-of-the-art Operation & Maintenance techniques at par with global standards. About 50% of total power generated in the country is wheeled through transmission network.

POWERGRID has been contributing significantly towards development of Indian power sector by undertaking coordinated development of power transmission network along with effective and transparent operation of regional grids and through continuous innovations in technical & managerial fields.

In the meeting of Standing Committee on Power System Planning in Eastern Region held on 20.09.2010 at NRPC, New Delhi, establishment of high capacity interconnection in the southern and northern part of West Bengal was discussed. It was decided that the system requirement would be firmed-up after the detailed study to be carried out jointly by CEA, POWERGRID, ERLDC & WBSETCL. Accordingly, joint system studies were carried out corresponding to peak and light load conditions especially during low hydro scenario in NER/Bhutan keeping in view the Subashgram sub-station expansion problem, non-availability of Right of Way from Subashgram, and severe system (operational) constraints in the Farakka-Malda 400KV corridor.

The results of the studies were discussed in a joint meeting of CEA, POWERGRID, ERLDC & WBSETCL held at POWERGRID, Gurgaon on 04.10.2010. Based on the discussion, a high capacity transmission corridor between Southern and Northern part of West Bengal was firmed up with establishment of new 400/220 KV sub-station at Rajarhat in southern part of West Bengal and 400KV D/c line from Rajarhat to Purnea in Northern part of Bihar with LILO of one circuit at Farakka STPP (NTPC) and other circuit at Gokarna 400 KV sub-station of WBSETCL.

The above system strengthening in Eastern Region was discussed and agreed by CEA and beneficiaries of Eastern Region to be implemented by POWERGRID as a regional strengthening scheme (Eastern Region Strengthening Scheme - V) during Standing Committee Meeting on Power System Planning of Eastern Region held on 28th December 2010 and subsequently during 17th meeting of Eastern Regional Power Committee (ERPC) held on 17th March 2011. **Minutes of Meeting enclosed at Annexure-I.**



Initial Environment Assessment Report (IEAR) for ERSS-V has been prepared which includes i) Rajarhat-Purnea 400 KV D/C Line ii) LILO of Subashgram-Jeerat 400 KV D/C Line at Rajarhat iii) LILO of Purnea-Rajarhat 400 KV D/C Line at Farakka iv) LILO of Purnea-Rajarhat 400 KV Line at Gokarna. The report describes the environmental issues/affects that might arise due to setting up proposed project in the States of West Bengal, Jharkhand & Bihar and various mitigation measures that will be taken care of by POWERGRID during design, construction and maintenance stages.

1.2 PROJECT JUSTIFICATION

Load demand in Kolkata, particularly in Jeerat/ Subashgram/ Laxmikantpur area is increasing rapidly due to growth of housing, commercial and industrial complexes. Power supply arrangements in these areas are being strengthened to meet the present and future demand. WBSETCL is taking action to add one more 315 MVA, 400/220 KV ICT at Jeerat. However, severe constraint is faced in expansion of Subashgram sub-station mainly because of the serious problem of Right of Way for any additional line in this area. In the Northern part of West Bengal, severe system constraints are experienced in the Farakka-Malda 400KV section when low hydro scenario occurs in ER grid.

In view of the above problems, detailed system studies considering peak condition in ER and low hydro scenarios in NER/Bhutan were carried out wherein it was noted that there is a need to establish a high capacity interconnection between the Northern and Southern part of West Bengal. The study result shows that establishment of a new substation at Rajarhat in the southern part of Kolkata and a new 400KV link from Rajarhat to Purnea in northern part of Bihar would provide a good technical solution to the above problem meeting the system requirement as a whole in the Malda-Farakka-Jeerat-Subashgram corridor. In addition, LILO of the existing 400 KV Jeerat-Subashgram S/c line at Rajarhat would provide an interconnection among the 400KV Jeerat, Subashgram and Rajarhat substations which in turn would improve the reliability of power supply in the adjoining areas.

Keeping in view the RoW problems in West Bengal, triple snowbird conductor line having higher power carrying capacity than twin moose conductor in the 400KV Rajarhat-Purnea D/C line has been considered which would enable to meet the long term system requirement. Further, in view of the severe land acquisition problem, the substation at Rajarhat has been planned as GIS substation.

Accordingly, the following system strengthening scheme has been planned as Eastern Regional System Strengthening Scheme -V:

1. Establishment of 400/220 KV, 2X500 MVA Rajarhat GIS substation with LILO of Subhashgram-Jeerat 400KV S/c line
2. Rajarhat-Purnea 400 KV D/c line (triple snowbird), with LILO of one circuit at Gokarna and other circuit at Farakka.

Here, it may be mentioned that WBSETCL is implementing Chanditala-Subhashgram 400KV D/c intra-state line. In view of space/RoW constraint at Subashgram, it was



decided to terminate Chanditala-Subhashgram 400KV D/C line at Rajarhat S/S to make it Chanditala - Rajarhat 400KV D/C line.

Further, it is also to mention that Eastern Region Strengthening Scheme-III includes LILO of Jamshedpur - Rourkela 400KV D/c line at Chaibasa wherein LILO of one circuit will be terminated at Chaibasa whereas LILO of other circuit would be routed through Chaibasa without terminating at Chaibasa (bypassing Chaibasa sub-station). Subsequently, WBSETCL planned a 400 KV D/c line from their Kharagpur sub-station to Jamshedpur sub-station of POWERGRID. However, due to severe space constraints at Jamshedpur (POWERGRID) sub-station, it was decided to terminate this line at Chaibasa instead of Jamshedpur. In view of the above, it was also decided that LILO of other circuit of Rourkela - Jamshedpur 400 KV D/c line shall be terminated at Chaibasa. The same was discussed and agreed In the meeting of Standing Committee on Power System Planning in Eastern Region held on 20.09.2010 at NRPC, New Delhi and 16th ERPC meeting held on 18.12.2010 at Bhubaneswar. Accordingly, scope of termination of other circuit at Chaibasa has also been included under the subject project.

1.3 BENEFITS OF THE PROJECT

The proposed project shall facilitate strengthening of the regional system in Eastern Region (ER) in order to cater to the load during low hydro scenario in North-Eastern Region / Bhutan. Additionally, the project is likely to generate direct and indirect employment opportunities, promote industrial growth and stimulate overall development of the area.

1.4 PROJECT OBJECTIVE

The target beneficiaries of the Transmission scheme are constituents of the Eastern Region.

1.5 PROJECT HIGHLIGHTS

a)	Project Name	:	Eastern Region System Strengthening-V
b)	Location	:	Eastern Region
c)	Beneficiary States/UT	:	Constituents of Eastern region
d)	Project Cost	:	Rs.1293.17 Crores at April 2012 Price Level (Including IDC of Rs. 72.77 Crores)
e)	Commissioning Schedule	:	Feb' 2016

1.6 SCOPE OF WORK

The complete scope of the transmission system to be implemented under the scheme is as follows:



Sub-Station

- Establishment of new 400/220 KV GIS substation at Rajarhat in West Bengal
- Extension at 400/220 KV Purnea (POWERGRID) substation
- Extension at 400 KV Gokarna (WBSETCL) substation
- Extension at 400 KV Farakka (NTPC) switchyard
- Extension at 400 KV Chaibasa (POWERGRID) sub-station

Transmission Line

- Rajarhat-Purnea 400 KV D/c line (with triple snowbird conductor), 439.351 kms
- LILO of Subashgram - Jeerat 400KV S/c line at Rajarhat, 4 kms
- LILO of Purnea-Rajarhat 400 KV D/C Line at Farakka, 19.002 kms
- LILO of Purnea-Rajarhat 400 KV Line at Gokarna, 16.889 kms

Note: Eastern Region Strengthening Scheme-III includes LILO of Jamshedpur - Rourkela 400KV D/c line at Chaibasa wherein LILO of one circuit will be terminated at Chaibasa whereas LILO of other circuit would be routed through Chaibasa without terminating at Chaibasa (bypassing Chaibasa sub-station). This LILO of other circuit shall be terminated at Chaibasa in this scheme.

A power map showing the transmission grid of Eastern Region highlighting the above scope of works has been placed as **Exhibit-1**.



SECTION II: BASELINE DATA

2.0 DESCRIPTION OF ENVIRONMENT

The proposed transmission project involves 4 transmission lines i.e. Rajarhat-Purnea 400 KV D/C Line, LILO of Subashgram-Jeerut 400 KV D/C Line at Rajarhat, LILO of Purnea-Rajarhat 400 KV D/C Line at Farakka, LILO of Purnea-Rajarhat 400 KV Line at Gokarna. Four transmission lines and associated substation & extensions are located in the states of West Bengal, Jharkhand & Bihar.

- (i) Rajarhat-Purnea 400 KV D/C Line.
- (ii) LILO of Subashgram-Jeerut 400 KV D/C Line at Rajarhat.
- (iii) LILO of Purnea-Rajarhat 400 KV D/C Line at Farakka.
- (iv) LILO of Purnea-Rajarhat 400 KV Line at Gokarna.

The base line data on general conditions as well as Environmental details in brief of above referred states are described below.

2.1 West Bengal

West Bengal is situated in the eastern part of the country between 21°20' N and 27°32' N latitude and 85°50' E and 89°52' E longitude sharing borders with Bangladesh, Nepal and Bhutan. Geographical area of the state is 88,752 sq. km. (8.88 million ha) which is 2.7% of the total area of the country. The state falls in the physiographic zones of Eastern Himalayas and Eastern Plains and has two distinct natural divisions: the North Himalayas and the South Alluvial Gangetic Plain. The state has famous delta of Indian Sunderbans.

The land use pattern is shown in Table below:

Table 2.1- Land Use Pattern

Land use	Area in '000 ha	Percentage
Geographical area	8,875	
Total reporting area	8,684	100
Forests	1,174	13.52
Not available for cultivation	1,814	20.89
Permanent pasture and other grazing land	7	0.08
Land under misc. tree crops and groves	55	0.63
Culturable wasteland	32	0.37
Fallow land other than current fallow	22	0.25
Current fallow	287	3.3
Net Area sown	5,294	60.96

Source: Land Use Statistics, Ministry of Agriculture, GOI, 2008-09

Climate

The state has a diverse climate, varying from moist tropical in the southeast to dry tropical in the southwest and from subtropical to temperate in the mountains in the north.



Rainfall

Annual rainfall varies from 900 mm in southwest to about 5000 mm in northern parts of the state.

Temperature

The minimum temperature goes even below 0 °C in winter in hill region of north and is as high as 46 °C summer in red laterite and gravelly undulating region. Maximum temperature during summer is 24°, 38°, and 37°C in North hill. The temperature during winter is as low as 7.9°C in red, laterite and gravelly undulating region.

Soil

The soils of West Bengal are divided into different categories. They are Brown forest Soils, Tarai and Teesta alluvial soils, Red and Laterite, Gravelly soils, Gangetic alluvial soils, Vindhyan alluvial soils and Coastal soils.

Mineral Resources

The state contributes about one-fifth to the total production of minerals in the country. Coal constitutes 99% of the minerals extracted in West Bengal; fireclay, china clay, limestone, copper, iron, wolfram, manganese and dolomite are mined in small quantities. There are good possibilities of obtaining mineral oil and natural gas in the areas near the Bay of Bengal, in Purba Medinipur, Sundarbans and North Bengal plains. West Bengal is the third largest state for coal production, accounting for about half of India's total. Coal is extracted from about 228 mines in the Raniganj and Asansol region of Bardhaman district.

West Bengal ranks next to Bihar and Madhya Pradesh in production of fireclay. Most of this mineral is extracted in the Raniganj region along with few amount is also extracted from Birbhum and Purulia. China clay used in the pottery, paper, textile, rubber and paint industries are unearthed at Mohammad Bazar in Birbhum and Mejia in Bankura. Rest of the production comes from Purulia, Bardhaman, Darjeeling and Jalpaiguri. Limestone which is used in cement industry is mined in Bankura, Purulia, Darjeeling and Jalpaiguri. There are copper mines in Jalpaiguri and Darjeeling. Small quantities of low quality iron-ore are mined in Bardhaman, Purulia, Birbhum and Darjeeling. There are manganese in the Jhargram region of Paschim Medinipur, Purulia and Bardhaman. Wolfram is mined at Jhilimili in Bankura.

Water Resources

The main rivers of the state are Teesta, Brahamaputra, Jaldhaka, Torsha, Sankosh, Raidak, Mahananda, Mahanadi, Balason, Machi, Tangan, Punarbhava, Atrai, Ganga, Bhagirathi, Mayurakshi, Brahmani, Dwaraka, Bakreswar, Kopai, Damodar, Hooghly, Rupanarayan, Kansabati or Kasai and Subarnarekha



Ecological Resources

The recorded forest area of the state is 11,879 sq. km. which is 13.38 % of the total geographical area of the state. As per legal classification, Reserved Forest constitutes 59.38%, Protected Forest 31.75 % and Unclassified Forest 8.87 %. Refer **Map-1** for Forest Map of West Bengal.

Protected Areas

The state has 0.29 million ha, i.e. 3.26% of its geographical area under Protected Areas comprising of 5 National Parks and 15 Wildlife Sanctuaries. There are 2 Tiger Reserves, namely, Sundarbans and Buxa in the state. Sunderbans is a unique eco-system having substantial area under mangrove forests. Recognizing its special conservation value, the area has been declared as Biosphere Reserve (0.96 million ha) which includes a Tiger Reserve and a National Park. Sundarbans National Park is also a World Heritage site. In addition, two Elephant Reserves, namely, Eastern Duars Elephant Reserve and Mayur Jharna have been formed in the northern and southern parts of the state respectively.

Forest Cover

The forest cover in the state, based on interpretation of satellite data of November 2008-January 2009, is 12,995 sq. km which is 14.64% of the state's geographical area. In terms of forest canopy density classes, the state has 2,984 sq.km area under very dense forests, 4,646 sq.km area under moderately dense forests and 5,365 sq.km area under open forests.

Rajarhat-Purnea 400 KV D/C line shall pass through North 24 Parganas, South 24 Parganas, Nadia, Bardhaman, Murshidabad, and Birbhumi.

LILO of Subashgram-Jeerut 400 KV D/C Line at Rajarhat shall pass through Distt. North 24 Parganas.

LILO of Purnea-Rajarhat 400 KV D/C Line at Farakka shall pass through Distt. Murshidabad.

LILO of Purnea-Rajarhat 400 KV Line at Gokarna shall pass through Distt. Murshidabad.

It will have almost negligible impact on forest cover as areas through which lines are proposed to pass has forest cover ranging from 2.01% to 24.16% of the total geographical area only. Details of forest cover of these districts are as follows:

Table 2.2

District	Geographic area (Sq. Km.)	2011 Assessment (Sq.Km.)				% of G.A	
		Very dense forest	Mod. dense forest	Open forest	Total		
1. Rajarhat-Purnea 400 KV D/C line							
North Parganas	24	4,094	20	18	51	89	2.17
South	24	9,960	1,014	889	503	2,406	24.16



Parganas							
Nadia	3,927	2	74	53	129	3.28	
Bardhaman	7,024	44	135	82	261	3.72	
Murshidabad	5,324	0	63	44	107	2.01	
Birbhumi	4,545	0	42	63	105	2.31	
2. LILO of Subashgram-Jeerut 400 KV D/C Line at Rajarhat							
North Parganas	24	4,094	20	18	51	89	2.17
3. LILO of Purnea-Rajarhat 400 KV D/C Line at Farakka							
Murshidabad		5,324	0	63	44	107	2.01
4. LILO of Purnea-Rajarhat 400 KV Line at Gokarna							
Murshidabad		5,324	0	63	44	107	2.01

Source: Forest Survey Report 2011

Human and Economic Development

Agriculture is the leading occupation in West Bengal. Rice is the state's principal food crop. Rice, potato, jute, sugarcane and wheat are the top five crops of the state. Tea is produced commercially in northern districts; the region is well known for Darjeeling and other high quality teas. State industries are localized in the Kolkata region, the mineral-rich western highlands, and Haldia port region. The Durgapur–Asansol colliery belt is home to a number of major steel plants. Manufacturing industries playing an important economic role are engineering products, electronics, electrical equipment, cables, steel, leather, textiles, jewellery, frigates, automobiles, railway coaches, and wagons. The Durgapur centre has established a number of industries in the areas of tea, sugar, chemicals and fertilizers. Natural resources like tea and jute in and nearby parts has made West Bengal a major centre for the jute and tea industries.

West Bengal has the sixth largest economy (2009–2010) in India, Kolkata is becoming a major hub for the Information technology (IT) industry. Many corporate companies are now headquartered in Kolkata include ITC Limited, India Government Mint, Kolkata, Haldia Petrochemicals, Exide Industries, Hindustan Motors, Britannia Industries, Bata India, Birla Corporation, CESC Limited, Coal India Limited, Damodar Valley Corporation, PwC India, Peerless Group, United Bank of India, UCO Bank and Allahabad Bank.

As of 2011, the total railway route length is around 4,481 km (2,784 mi), Kolkata is the headquarters of two divisions of the Indian Railways—Eastern Railway and South Eastern Railway. The Northeast Frontier Railway (NFR) plies in the northern parts of the state. The Kolkata metro is the country's first underground railway. The Darjeeling Himalayan Railway, part of NFR, is a UNESCO World Heritage Site.

The state's largest international airport is Netaji Subhas Chandra Bose International Airport at Dum Dum, Kolkata. Bagdogra airport near Siliguri is another significant airport in the state which originally served domestic services, but now also serves international services to Bhutan and Thailand. Kolkata is a major river-port in eastern India. The Kolkata Port Trust manages both the Kolkata docks and the Haldia docks.



Several government-owned organizations operate substandard bus services in the state, including the Calcutta State Transport Corporation, the North Bengal State Transport Corporation, the South Bengal State Transport Corporation, the West Bengal Surface Transport Corporation, and the Calcutta Tramways Company.

2.2 Jharkhand

Jharkhand has the geographical area of 79,714 sq.km which accounts for 2.42% of the country's area. The state falls between 22°00' N - 24°37' N latitude and 83°15' E - 87°01' E longitude. Most of the state lies on the Chota Nagpur Plateau, which is the source of the Koel, Damodar, Brahmani, Kharkai, and Subarnarekha rivers.

The land use pattern of the state is given below:

Table 2.3

Land use	Area in '000 ha	Percentage
Total geographical area	7,972	
Reporting area for land utilization	7,970	100.00
Forests	2,239	28.09
Not available for cultivation	1,332	16.71
Permanent pasture and other grazing lands	110	1.38
Land under misc. tree crops and groves	93	1.17
Culturable wasteland	336	4.22
Fallow lands other than current fallows	962	12.07
Current fallows	1,394	17.49
Net area sown	1,504	18.87

Source: Land use statistics, Ministry of Agriculture, GOI, 2008-09

Climate

There are three well-defined seasons in Jharkhand. The cold-weather season, from November to February, is the most pleasant part of the year. High temperatures in Ranchi in December usually rise from about 50 °F (10 °C) into the low 70°F (low 20°C) daily. The hot-weather season lasts from March to mid-June. May, the hottest month, is characterized by daily high temperatures in the upper 90°F (about 37 °C) and low temperatures in the mid-70°F (mid-20 °C).

Rainfall

Jharkhand has a tropical climate with annual average rainfall of about 900 mm.

Temperature

The temperature varies between 4°C to 47°C.

Soil

Major Soils are Red soil, Micacious soil, Sandy soil, Laterite soil.



Mineral Resources

Jharkhand accounts for 40% of the mineral resources of India. Ranchi accounts for 50% mineral production of the state, nearing about 18% of nation's mineral production. Minerals found in Jharkhand are iron ore, coal, Manganese, limestone, China Clay, fire clay, graphite, kainite, chromite, asbestos, thorium, sillimanite, uranium and even gold and silver and several other minerals.

Water Resources

Major rivers of Jharkhand are Koel, Damodar, Baitarani, Hinglo, Jamunia, Brahmani, Karo, Sankh, Son, Koina, Konar, Kharkai, and Subarnarekha.

Ecological Resources

The recorded forest area of the state is 23,605 sq.km which is 29.61% of its geographical area. Reserved Forests constitute 18.58%, Protected Forests 81.28% and Unclassed Forests 0.14%.

Protected Areas

Jharkhand has one National Park and 11 Wildlife Sanctuaries covering 2,182.15 sq.km which constitutes 2.74% of the state's geographical area. Palamu Tiger Reserve is located in the state covering an area of 1,026 sq.km. Refer **Map-2** for Forest Map of Jharkhand.

Forest Cover

The forest cover in the state, based on interpretation of satellite data of November 2008-January 2009, is 22,977 sq.km which is 28.82% of the state's geographical area. In terms of forest canopy density classes, the state has 2,590 sq.km area under very dense forest, 9,917 sq.km area under moderately dense forest and 10,470 sq.km area under open forest.

Rajarhat-Purnea 400 KV D/C line shall pass through Pakur, Godda and Sahebganj districts of Jharkhand.

It will have minimal impact on forest cover as areas through which line is proposed to pass has forest cover ranging from 18% to 29% of the total geographical area only. Details of forest cover of these districts are as follows:

Table 2.4

District	Geographic area (Sq. Km.)	2011 Assessment (Sq.Km.)				% of G.A
		Very dense forest	Mod. dense forest	Open forest	Total	
Pakur	1571	3	172	108	283	18.01
Godda	2110	15	268	116	399	18.91
Sahebganj	1834	21	336	193	550	29.99

Source: Forest Survey Report 2011



Human and Economic Development

Jharkhand's gross state domestic product for 2011 is estimated at \$ 21.7 billion at current prices. It is rich in minerals.

Jharkhand has a concentration of some of the country's highly industrialized cities such as Jamshedpur, Ranchi, Bokaro Steel City, Dhanbad and Ramgarh. It also has several firsts in India, including Largest fertilizer factory of its time in India (since shut down) at Sindri, First Iron & steel factory at Jamshedpur, Largest Steel plant in Asia (Bokaro steel plant, Bokaro), Biggest explosives factory at Gomia, Bokaro, Tata Steel has established country's first coal washery at Ghato, Ramgarh district in the year 1951 & First methane gas well at Parbatpur, Bokaro.

The literacy rate in Jharkhand is 67.63% (2011). As per the 2011 census conducted by Government of India the official literacy rate for the state was 67.63% (Male: 78.45%; Female: 56.21%) with 9 districts above the average literacy rate.

2.3 Bihar

Bihar, situated in the eastern part of India bordering Nepal, has a geographical area of 94,163 sq.km which constitutes 2.86% of the country's total area. The state is situated between 24° 16' N - 27 °45' N latitude and 83°16' E - 88° 30' E longitude.

It is an entirely land-locked state, although the outlet to the sea through the port of Kolkata is not far away. Bihar lies mid-way between the humid West Bengal in the east and the sub humid Uttar Pradesh in the west which provides it with a transitional position in respect of climate, economy and culture. It is bounded by Nepal in the north and by Jharkhand in the south. The Bihar plain is divided into two unequal halves by the river Ganga which flows through the middle from west to east. The land use pattern is shown in Table below:

Table 2.5- Land Use Pattern

Land use	Area in '000 ha	Percentage
Geographical area	9416	
Total reporting area	9360	100
Forests	622	6.65
Not available for cultivation	2085	22.28
Permanent pasture and other grazing land	16	0.17
Land under misc. tree crops and groves	241	2.57
Culturable wasteland	46	0.49
Fallow land other than current fallow	119	1.27
Current fallow	569	6.08
Net Area sown	5662	60.49

Source: Land Use Statistics, Ministry of Agriculture, GOI, 2008-09

Climate

Bihar has a diverse climate. Its temperature is subtropical in general, with hot summers and cool winters.



Rainfall

Annual rainfall in the state varies from 1,000 mm to 2,000 mm.

Temperature

Mean annual temperature ranges between 20°C to 28°C.

Soil

The soils of Bihar are Piedmont Swamp Soil, Terai Soil, The Gangetic Alluvium.

Mineral Resources

Major Minerals found in Bihar are Steatite, Pyrites, Quartzite, Crude Mica, Limestone.

Water Resources

Bihar is richly endowed with water resources, both the ground water resource and the surface water resource. Not only by rainfall but it has considerable water supply from the rivers which flow within the territory of the State. Ganga is the main river which is joined by tributaries with their sources in the Himalayas. Some of them are Saryu (Ghaghra), Gandak, Budhi Gandak, Bagmati, Kamla-Balan and Mahananda.

There are some other rivers that start from the plateau area and meet in Ganges or its associate rivers after flowing towards north. Some of them are Sone, Uttari Koyal, Punpun, Panchane and Karmnasha.

Ecological Resources

The recorded forest area of the state is 6,473 sq.km which is 6.87% of its geographical area. The Reserved Forests constitute 10.70%, Protected Forests 89.28% and Unclassed Forests 0.02% of the total forest area. Refer **Map-3** for Forest Map of Bihar.

Protected Areas

Bihar has one National Park and 12 Wildlife Sanctuaries covering an area of 0.32 million ha, which constitutes 3.38% of the total geographical area of the state. The lone tiger reserve of the state, viz. Valmiki Tiger Reserve covers an area of 84,000 ha. Kabar, situated in Begusarai district with an area of 6,738 ha, is a wetland of national importance.

Forest Cover

The forest cover in the state, based on interpretation of satellite data of Nov 2008-Jan 2009, is 6,845 sq.km which is 7.27% of the state's geographical area. In terms of forest canopy density classes, the state has 231 sq.km very dense forest, 3,280 sq.km moderately dense forest, and 3,334 sq.km open forest.



Rajarhat-Purnea 400 KV D/C line shall pass through Bhagalpur, Katihar and Purnea.

It will have almost negligible impact on forest cover as areas through which lines are proposed to pass has forest cover ranging from 1.46% to 2.03% of the total geographical area only. Details of forest cover of these districts are as follows:

Table 2.6

District	Geographic area (Sq. Km.)	2011 Assessment (Sq.Km.)				% of G.A
		Very dense forest	Mod. dense forest	Open forest	Total	
1. Rajarhat-Purnea 400 KV D/C line						
Bhagalpur	2567	0	29	13	42	1.64
Katihar	3057	0	18	44	62	2.03
Purnea	3229	0	6	41	47	1.46

Source: Forest Survey Report 2011

Human and Economic Development

The economy of Bihar is largely service-oriented, but it has a significant agricultural base. The state also has a small industrial sector. More recently, Bihar's state GDP recorded a very high growth (in the excess of 10%), making Bihar one of the fastest growing major state of India.

Rice, wheat, and maize are the major cereal crops of Bihar, while arhar urad, moong, gram, peas, lentils, and khesaria are some of the pulses crop cultivated in Bihar. Bihar is the largest producer of vegetables, especially potatoes, onions, brinjal, and cauliflower. In fruit cultivation, it is the largest producer of litchi, the third largest producer of pineapples and a major producer of mangoes, bananas, and guava. Sugarcane and jute are the other two major cash crops of Bihar.

Bihar has a very small industrial base compared to the other Indian states including neighboring Jharkhand. State of Bihar accounts for nearly about 8.5% of India's population and about 3% of its landmass. In percentage terms of industrial units, Bihar holds only around 1% of factories installed in India. In terms of output value, less than 1% of India's industrial output comes from Bihar. The industrial sector contributes about 5% to the GDP of Bihar, while the share of industrial sector in India's GDP is around 20%. Bihar's industrial sector is dominated by small household and cottage industries. Agro-based industries are major constituents of industrial sector in Bihar.

Bihar has emerged as brewery hub with major domestic and foreign firms setting up production units in the state. Bihar has a total literacy rate of 63.82% (75.7% for males and 55.1% for females), recording a growth of 20% in female literacy over the period of a decade.



SECTION III: POLICY, LEGAL AND REGULATORY FRAMEWORK

3.0 POWERGRID's activities by their inherent nature and flexibility have negligible impacts on environmental and social attributes. Indian laws relating to environmental and social issues have strengthened in the last decade both due to local needs and international commitments. POWERGRID undertakes its activities within the purview of Indian laws keeping in mind appropriate international obligations and directives and guidelines with respect to environmental and social considerations of Funding Agencies.

3.1 ENVIRONMENTAL:

3.1.1 Constitutional Provisions:

Subsequent to the first United Nations Conference on Human Environment at Stockholm in June, 1972, which emphasized the need to preserve and protect the natural environment, the Constitution of India was amended through the historical 42nd Amendment Act, 1976 by inserting Article 48-A and 51-A (g) for protection and promotion of the environment under the Directive Principles of State Policy and the Fundamental Duties respectively. The amendment, *inter alia* provide:

"The State shall endeavour to protect and improve the environment and to safeguard the forests and wildlife of the country". (New Article 48A)

"It shall be the duty of every citizen of India to protect and improve the natural environment including forests, lakes, rivers and wildlife and to have compassion for living creatures". (New Article 51 A(g))

Article 21 of the constitution provides, "no person shall be deprived of his life or personal liberty except according to procedure established by law".

Article 21 is the heart of the fundamental rights and has received expanded meaning from time to time after the decision of the Supreme Court in 1978. The Article 21 guarantee fundamental right to life – a life of dignity to be lived in a proper environment, free of danger of disease and infection. The right to live in a healthy environment as part of Article 21 of the Constitution. Recently, Supreme Court has broadly and liberally interpreted the Article 21, transgressed into the area of protection of environment, and held that the protection of environment and citizen's right to live in eco-friendly atmosphere interpreted as the basic right guaranteed under Article 21.

Thus the Indian Constitution has now two fold provision:

- (a) On the one hand, it gives directive to the State for the protection and improvement of environment.
- (b) On the other hand the citizens owe a constitutional duty to protect improve and natural environment.



3.1.2 Mandatory Requirements (National) :

- **MOP order/sanction under The Electricity Act, 2003 :**

Sanction of MOP, GOI is a mandatory requirement for taking up any new transmission project under the section 68(1) of The Electricity Act, 2003. The sanction authorize POWERGRID to plan and coordinate activities to commission the new project. Electricity act does not explicitly deal with environmental implications of activities related to power transmission. However, POWERGRID always integrates environmental protection within its project activities.

- **Forest Clearance under The Forest (Conservation) Act, 1980 :**

When transmission projects pass through forest land, clearance has to be obtained from relevant authorities under the Forest (Conservation) Act, 1980. This Act was enacted to prevent rapid deforestation and environmental degradation. State governments cannot de-reserve any forest land or authorize its use for any non-forest purposes without approval from the Central government. POWERGRID projects, when involving forest areas, undergo detailed review and approval procedures to obtain a Forest Clearance certificate from MOEF, Government of India before starting any construction activity in designated forest area.

- **Environmental Clearances under Environment (Protection) Act, 1986:**

Since transmission line projects are environmentally clean and do not involve any disposal of solid waste, effluents and hazardous substances in land, air and water they are kept out of the purview of Environment (Protection) Act, 1986. However, the recent amendment in the Environment (Protection) Act, 1986 made it necessary to obtain clearance from MoEF for power transmission projects in two districts in the Aravalis (*viz.*, Alwar in Rajasthan and Gurgaon in Haryana). The Aravali range, in these two areas, is heavily degraded, hence, any industrial activity there becomes critical. Environment Impact Notification, 1994 lays down specific project categories that require clearance from MoEF Power transmission projects are not included in this list.

- **Batteries (Management and Handling) Rules, 2001 :**

MoEF vide its notification dt. 16th May, 2001 under the section of 6, 8 and 25 of the Environment (Protection) Act, 1986 has put certain restriction on disposal of used batteries and its handling. As per the notification it is the responsibility of bulk consumer (POWERGRID) to ensure that used batteries are not disposed of, in any manner, other than by depositing with the dealer/manufacturer/registered recycler/importer/reconditioner or at the designated collection centres and to file half yearly return in prescribed form to the concerned State Pollution Control Board.

- **Hazardous Wastes (Management, Handling and Transboundary Movement) Amendment Rules, 2008 :**

MoEF vide its notification dt. 20th May, 2003 under the section of 6, 8 and 25 of the Environment (Protection) Act, 1986 has put used mineral oil under the category of hazardous waste which require proper handling and disposal. As per the notification, all



used oil is to be auctioned/sold to registered recyclers only and file annual return on prescribed form to the concerned State Pollution Control Board.

- **Ozone Depleting Substances (Regulation and Control) Rules, 2000 :**

MoEF vide its notification dt. 17th July, 2000 under the section of 6, 8 and 25 of the Environment (Protection) Act, 1986 has notified rules for regulation /control of Ozone Depleting Substances under Montreal Protocol adopted on 16th September 1987. As per the notification certain control and regulation has been imposed on manufacturing, import, export and use of these compound. POWERGRID is following provisions of notification and is phasing out all equipment which uses these substances and planning to achieve CFC free organization in near future.

- **The Biological Diversity Act, 2002 :**

Under the United Nations Convention on Biological Diversity signed at Rio de Janeiro on the 5th day of June, 1992 of which India is also a party, MoEF has enacted the Biological Diversity Act, 2002 to provide for conservation of biological diversity, sustainable use of its components and fair and equitable sharing of the benefits arising out of the use of biological resources, knowledge and for matters connected therewith. As per the provision of act certain area which are rich in biodiversity and encompasses unique and representative ecosystems are identified and designated as Biosphere Reserve to facilitate its conservation. All restrictions applicable to protected areas like National Park & Sanctuaries are also applicable to these reserves. POWERGRID will abide by the provision of act wherever applicable and try to totally avoid these biosphere reserves while finalizing the route alignment.

3.1.3 Funding Agencies :

WB Operational Policies (OP) 4.01/ADB's Safeguard Policy Statement (June 2009) and JBIC Environmental Guidelines: These outlines funding agencies policy and procedures for environmental assessment (EA) of different developmental projects. All these guidelines classified developmental projects into three categories (A-C) based on its possible environmental and social impacts though WB & ADB has another category F1 applicable only to projects involving a credit line through a financial intermediary.

Transmission line projects are categorized as category-B project having limited impact that can be further minimized through mitigative/management measures and would normally require only an environmental review. POWERGRID takes remedial measures to prevent, minimize, mitigate, or compensate for adverse impact and improve environmental performance. Environment Assessment will take account the natural environment, human health and safety, and social aspects and trans- boundary and global environmental aspects. During EA process public is also informed at every stage of project execution and their views are considered during decision-making process.

3.1.4 Prescriptive Framework (National):

- Applicable Legislations



3.1.4 Relevant Policies:

- National Conservation Strategy and Policy Statement on Environment and Development, 1992
- Policy statement for Abatement of pollution, 1992
- National Environment Policy, 2006

3.2.0 SOCIAL:

3.2.1 Constitutional Provisions:

Constitutional provisions in regard to social safeguards are well enshrined in the preamble such as **JUSTICE**, social, economic and political; **LIBERTY** of thought, expression, belief, faith and worship; **EQUALITY** of status and of opportunity; **FRATERNITY** assuring the dignity of the individual and the unity and integrity of the Nation. Fundamental Rights and Directive Principles guarantee the right to life and liberty. Health, safety and livelihood have been interpreted as part of this larger right. Social safeguards provisions are dealt in detail in different Article such as Article-14, 15 17, 23, 24, 25, 46, 330, 332 etc. POWERGRID, through this document, ESPP, commits itself to implementing the said constitutional provision in true spirit to fulfill its environmental and social obligations and responsibilities.

3.2.2 Mandatory Requirements (National) :

- **National Rehabilitation and Resettlement Policy, 2007 :**

Ministry of Rural Development, Government of India has notified a National policy on R&R for PAFs in Feb'04 applicable to all developmental projects where 500 or more families enmass in plain areas or 250 or more families enmass in hilly areas are displaced due to project activity. It essentially addresses the need to provide succor to the asset less rural poor, support the rehabilitation efforts of the resources and provide a broad canvas for an effective consultation between PAFs and authorities responsible for their R&R. It has also listed R&R measures and entitlements for different category of PAFs. Though the National policy as such is not applicable to POWERGRID because transmission projects do not involve displacement of such a large numbers of families since land required for substations is quite small. However, the entitlement benefits listed in the National policy for PAFs have been adopted by POWERGRID in its "Social Entitlement Framework" that is being implemented wherever land acquisition for substations is undertaken.

- **Rights of Way and Compensation under Electricity Act,2003 :**

The act has a provision for notifying transmission company under section 164 (B) to avail benefits of eminent domain provided under the Indian Telegraph Act, 1885. MOP, GOI vide gazette notification dt 23rd Dec'03 had already notified POWERGRID under this section of said act. Therefore, for the purpose of placing of any wires, poles, etc., POWERGRID has all the powers that the telegraph authority possesses. Thus,



POWERGRID can erect and construct towers without actually acquiring the land. However, all damages due to POWERGRID activity are compensated at market rate. Power transmission schemes are always planned in such a way that the power of eminent domain is exercised responsibly.

- **Provisions under Land Acquisition Act, 1894, as amended in 1984 :**

When land is acquired for sub-stations, POWERGRID will follow procedures laid down under the Land Acquisition Act (LA Act), 1894. POWERGRID sub-stations have never resulted in large scale displacement or loss of livelihoods. There have been only marginal impacts due to flexibility exercised by POWERGRID in selecting sites. The LA Act specifies that in all cases of land acquisition, no award of land can be made by the government authorities unless all compensation has been paid.

3.2.3.1 Funding Agencies :

For POWERGRID, mandatory requirements *vis-à-vis* Funding Agencies are comprehensive Resettlement and Rehabilitation (R&R) guidelines and an entitlement framework as per World Bank Operational Directives 4.30 (OP-4.12) and 4.20 and ADB's Safeguard Policy Statement, June 2009.

- **World Bank OD 4.30 (OP-4.12): Involuntary Resettlement :**

This directive describes Bank Policy and procedures on involuntary resettlement as well as conditions that borrowers are expected to meet during operations involving resettlement of affected groups. It requires a entitlement framework aimed at restoration, replacement and participation of affected groups. A detailed social assessment and development of an action plan having list of measures for betterment/restoration of lost assets/income is required to be submitted to bank before start of project work. However where only a few people (e.g. about 100-200 individuals) are to be relocated at a particular location, appropriate compensation for assets, logistical support for moving and a relocation grant may be the only requirements but the principle on which compensation is to be based will remain same as for larger groups.

- **World Bank OD 4.20: Indigenous People (IP):**

This directive describes World Bank policies and procedures for projects that affect indigenous people. The objective is to ensure that development benefits are socially and culturally compatible and that the IPs are consulted. Thus, the Indigenous People Development Plan/Tribal Development Plan is to be prepared as a prerequisite. POWERGRID will not only incorporate the IP component whenever necessary, but will also pay attention to marginalized groups such as women, children, etc.



- **ADB Safeguard Policy Statement, June 2009 :**

The SPS, June 2009 describes Bank Policy and operational procedures on three key safeguard areas viz Environmental, Involuntary resettlement and Indigenous Peoples as well as a set of specific safeguard requirements that borrowers are expected to meet during operations when addressing social and environment impacts and risks. Its objective is to ensure social and environmental sustainability of projects through avoidance, minimization, mitigation and/or compensate of adverse impacts on environment and affected peoples. It also classified project into three categories like category-A where resettlement is significant and involve physical displacement of more than 200 persons, which require a detailed resettlement plan. Category-B where resettlement is not that significant and requires a short resettlement plan. Category-C where no resettlement of peoples are foreseen and neither require neither resettlement plan nor a resettlement framework.

POWERGRID emphasizes that displacement is not an issue with transmission projects because land below tower/line is not acquired and only a small piece of land is required for substations. However, all affected persons/families shall be provided compensation and rehabilitation assistance along with other measures as per POWERGRID's social entitlement framework which is based on these directives/manuals and National R&R Policy to restore income/livelihood of all affected persons.

3.2.4 Prescriptive Framework (National) :

- National and State-wide Laws and Policies Relating to Land Acquisition and Issues of R&R
 - Madhya Pradesh Pariyojana Ke Karan Visthapit Vyakti (Punsthapan) Adhinyam, 1985
 - Maharashtra Project Affected persons Rehabilitation Act, 1986

3.2.5 Relevant Policies :

- Resettlement and Rehabilitation Policy- Coal India Ltd., May,2008
- Resettlement and Rehabilitation Policy- NHPC Ltd., 2007
- Policy for Rehabilitation and Resettlement of Land Owners – Land Acquisition Oustees – Haryana State, December, 2007;
- The Orissa Resettlement and Rehabilitation Policy, Orissa , May, 2006;Resettlement and Rehabilitation Policy – NTPC Ltd., June,2005.



SECTION-IV: POWERGRID APPROACH FOR ROUTE SELECTION

4.0 ROUTE SELECTION (ASSESSMENT & MANAGEMENT PROCESS)

At the system planning stage itself one of the factors that govern the evolution of system is the possible infringement with the forest. Wherever such infringements are substantial, different alternative options are considered. The route/ site selection criteria followed by POWERGRID is detailed below.

While identifying the transmission system for a generation project or as a part of National Power Grid, preliminary route selection is done by POWERGRID based on the Topo sheets of Survey of India and Forest Atlas (Govt. of India's Publication). During route alignment all possible efforts are made to avoid the forest area involvement completely or to keep it to the barest minimum, whenever it becomes unavoidable due to the geography of terrain or heavy cost involved in avoiding it.

4.1 STUDY OF ALTERNATIVES

Environmental Criteria for Route Selection

For selection of optimum route, the following points are taken into consideration:

- a) The route of the proposed transmission lines does not involve any human rehabilitation.
- b) Any monument of cultural or historical importance is not affected by the route of the transmission line.
- c) The proposed route of transmission line does not create any threat to the survival of any community with special reference to Tribal Community.
- d) The proposed route of transmission line does not affect any public utility services like playgrounds, schools, other establishments etc.
- e) The line route does not pass through any sanctuaries, National Park etc.
- f) The line route does not infringe with area of natural resources.

In order to achieve this, POWERGRID undertakes route selection for individual transmission lines in close consultation with representatives from the Ministry of Environment and Forests and the Department of Revenue. Although under National law POWERGRID has right of eminent domain to put a tower in Pvt. land (Section 63 of the Electricity Act,2003) yet alternative alignments are considered keeping in mind the above-mentioned factors during site selection, ***with minor alterations often added to avoid environmentally sensitive areas and settlements at execution stage.***

- As a rule, alignments are generally cited 10-15 km away from major towns, whenever possible, to account for future urban expansion.
- Similarly, forests are avoided to the extent possible, and when it is not possible, a route is selected in consultation with the local Divisional Forest Officer, that causes minimum damage to existing forest resources.



- Alignments are selected to avoid wetlands and unstable areas for both financial and environmental reasons.

In addition, care is also taken to avoid National parks and sanctuaries and any other forest area rich in wild life.

Keeping above in mind the route for proposed lines have been so aligned that it takes care of above factors. As such different alternatives were studied with the help of Govt. published data like Forest atlas, Survey of India topo-maps to arrive at most optimum route which can be taken up for detailed survey and assessment of environmental & social impacts for their proper management.

4.1a EVALUATION OF ALTERNATIVE ROUTE ALIGNMENT OF RAJARHAT-PURNEA 400 KV D/C LINE

Three different alignments (**Map-4**) were studied with the help of published data/maps and walkover survey to arrive at most optimum route for detailed survey. The comparative details of these alternatives for the above line is given in the following table:

S.No	Description	Alternative-I	Alternative-II	Alternative-III
1.	Route Particulars			
i)	Length(Km)	439.351	455.266	453.182
ii)	Terrain	Plain	Plain with some hilly	Plain with mild undulation
2	Environment Details			
i)	Name of District/District Detail (through which line passes)	North 24 Parganas, South 24 Parganas, Nadia, Bardhaman, Murshidabad, Birbhumi, Pakur, Godda, Sahebganj, Bhagalpur, Katihar and Purnea.	North 24 Parganas, South 24 Parganas, Nadia, Bardhaman, Murshidabad, Birbhumi, Pakur, Godda, Sahebganj, Bhagalpur, Katihar and Purnea.	North 24 Parganas, South 24 Parganas, Nadia, Bardhaman, Murshidabad, Birbhumi, Pakur, Godda, Sahebganj, Bhagalpur, Katihar and Purnea.
ii)	Town in alignment (nearby)	Kolkata, Habra, Nalhati, Chakda, Ranaghat, Kalna, Nabadwip, Katwa, Kandi, Rampurhat, Pakur, Farakka, Sahib ganj, Katihar & Purnea.	Kolkata, Habra, Nalhati, Chakda, Ranaghat, Kalna, Nabadwip, Katwa, Kandi, Rampurhat, Pakur, Farakka, Sahebganj, Katihar & Purnea.	Kolkata, Habra, Nalhati, Chakda, Ranaghat, Kalna, Nabadwip, Katwa, Kandi, Rampurhat, Pakur, Farakka, Sahebganj, Katihar & Purnea.
iii)	House in R.O.W.	Nil	2	3
iv)	Forest Involvement in Ha/kms	11.96 Ha / 2.6 Kms	67.62 Ha / 14.7 Kms	22.08 Ha / 4.8 Kms
v)	Type of forest	PF	PF	PF
vi)	Density of forest	<0.5	<0.5	<0.5
vii)	Type of Flora	Mango, Blackberry, Jack Fruit, Neem ,	Mango, Blackberry, Jack Fruit, Neem ,	Mango, Blackberry, Jack Fruit, Neem ,



		Plum, Coconut etc	Plum, Coconut etc	Plum, Coconut etc
viii)	Type of fauna	Fox, Cat, Snake, Leopard, Hyena etc.	Fox, Cat, Snake, Leopard, Hyena etc.	Fox, Cat, Snake, Leopard, Hyena etc.
ix)	Endangered species(if any)	Nil	Nil	Nil
x)	Historical/Cultural Monument	Nil	Nil	Nil
xi)	Any other relevant information	Nil	Nil	Nil
3.	Compensation Cost (in Rs lakhs)			
i)	Crop (Non-Forest)	436.75	440.56	448.38
ii)	Forest (CA+NPV)	135.5	766.13	250.16
4.	No. of Crossing (Nos.)			
i)	Railway line	11	14	14
ii)	Power Line	24	20	18
iii)	River Crossing etc.	7	11	10
iv)	Highway Crossing	12	5	8
5.	Construction Problem	Easy approach. Less forest Involvement.	Moderate Approach. Maximum forest involvement. Moderate ROW problems.	Moderate forest Involvement. Moderate ROW problem.
6.	O&M Problem	O & M shall be relatively easier due to better approaches and plain terrain	O & M shall be difficult due to hilly terrain.	O & M shall be difficult due to undulations.
7.	Overall Remarks	Easy accessibility less ROW problems & minimum forest involvement.	Easy accessibility but more line length with moderate ROW problems & high forest involvement.	Easy accessibility but moderate ROW problems & forest involvement comparatively more.

Reasons for Selection of Final Route

From the above comparison of three different Alternatives, it is evident that the **Alternative-I** is the most suitable route as it involves minimum forest area, has relatively less ROW problem and also easily approachable and house involvement in RoW is nil. Hence **Alternative-I** has been found most suitable and selected for detailed survey.

4.1b EVALUATION OF ALTERNATION ROUTE ALIGNMENT OF LILO OF SUBASHGRAM-JEERUT 400 KV D/C LINE AT RAJARHAT

The length of line as per preliminary survey is 4 kms. So, Alternative Route Study of 3 different alternatives has not been done for the line. The preliminary route alignment is enclosed as **Map-5**. As per preliminary route alignment, the line may involve 1 Ha of forest area.



4.1c EVALUATION OF ALTERNATION ROUTE ALIGNMENT OF LILO OF PURNEA-RAJARHAT 400 KV D/C LINE AT FARAKKA

Three different alignments (**Map-6**) were studied with the help of published data/maps and walkover survey to arrive at most optimum route for detailed survey. The comparative details of these alternatives for the above line is given in the following table:

S.No	Description	Alternative-I	Alternative-II	Alternative-III
1.	Route Particulars			
i)	Length(Km)	19.002	21.940	20.607
ii)	Terrain	Plain	Plain	Plain
2	Environment Details			
i)	Name of District/District Detail (through which line passes)	Murshidabad	Murshidabad	Murshidabad
ii)	Town in alignment (nearby)	Pakur, Farakka.	Pakur, Farakka.	Pakur, Farakka.
iii)	Forest Involvement in Ha/kms	1 Ha / 0.21 Kms	4.6 Ha / 1 Kms	4.6 Ha / 1 Kms
iv)	Type of forest	PF	PF	PF
v)	Density of forest	<0.5	<0.5	<0.5
vi)	Type of Flora	Mango, Blackberry, Jack Fruit, Neem , Plum, Coconut etc	Mango, Blackberry, Jack Fruit, Neem , Plum, Coconut etc	Mango, Blackberry, Jack Fruit, Neem , Plum, Coconut etc
vii)	Type of fauna	Fox, Cat, Snake, Leopard, Hyena etc.	Fox, Cat, Snake, Leopard, Hyena etc.	Fox, Cat, Snake, Leopard, Hyena etc.
viii)	Endangered species(if any)	Nil	Nil	Nil
ix)	Historical/Cultural Monument	Nil	Nil	Nil
x)	Any other relevant information	Nil	Nil	Nil
3.	Compensation Cost (in Rs lakhs)			
i)	Crop (Non-Forest)	18.792	20.94	19.607
ii)	Forest (CA+NPV)	11.33	52.11	52.11
4.	No. of Crossing (Nos.)			
i)	Railway line	1	1	1
ii)	Power Line	3	3	3
5.	Construction Problem	Easy approach. Less forest Involvement.	Moderate Approach. Moderate forest Involvement. Moderate ROW problems.	Moderate forest Involvement. Moderate ROW problem.
6.	O&M Problem	O & M shall be relatively easier due to better approaches and plain terrain	O & M shall be moderately difficult.	O & M shall be moderately difficult.
7.	Overall Remarks	Easy accessibility	Easy accessibility but	Easy accessibility



		less ROW problems & minimum forest involvement.	more line length with moderate ROW problems & more forest involvement.	but moderate ROW problems & forest involvement comparatively more.
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Reasons for Selection of Final Route

From the above comparison of three different Alternatives, it is evident that the **Alternative-I** is the most suitable route as it involves minimum forest area, has relatively less ROW problem and also easily approachable. Hence **Alternative-I** has been found most suitable and selected for detailed survey.

4.1d EVALUATION OF ALTERNATION ROUTE ALIGNMENT OF LILO OF PURNEA-RAJARHAT 400 KV LINE AT GOKARNA

Three different alignments (**Map-7**) were studied with the help of published data/maps and walkover survey to arrive at most optimum route for detailed survey. The comparative details of these alternatives for the above line is given in the following table:

S.No	Description	Alternative-I	Alternative-II	Alternative-III
1.	Route Particulars			
i)	Length(Km)	16.889	18.703	26.344
ii)	Terrain	Plain	Plain	Plain
2	Environment Details			
i)	Name of District/District Detail (through which line passes)	Murshidabad	Murshidabad	Murshidabad
ii)	Town in alignment (nearby)	Gokarna, Kandi	Gokarna, Kandi	Gokarna, Kandi
iii)	Forest Involvement in Ha/kms	1 Ha / 0.21 Kms	4.6 Ha / 1 Kms	4.6 Ha / 1 Kms
iv)	Type of forest	PF	PF	PF
v)	Density of forest	<0.5	<0.5	<0.5
vi)	Type of Flora	Mango, Blackberry, Jack Fruit, Neem , Plum, Coconut etc	Mango, Blackberry, Jack Fruit, Neem , Plum, Coconut etc	Mango, Blackberry, Jack Fruit, Neem , Plum, Coconut etc
vii)	Type of fauna	Fox, Cat, Snake, Leopard, Hyena etc.	Fox, Cat, Snake, Leopard, Hyena etc.	Fox, Cat, Snake, Leopard, Hyena etc.
viii)	Endangered species(if any)	Nil	Nil	Nil
ix)	Historical/Cultural Monument	Nil	Nil	Nil
x)	Any other relevant information	Nil	Nil	Nil
3.	Compensation Cost (in Rs lakhs)			
i)	Crop (Non-Forest)	16.679	17.703	25.344
ii)	Forest (CA+NPV)	11.33	52.11	52.11
4.	No. of Crossing (Nos.)			



i)	Railway line	0	0	0
ii)	Power Line	3	3	4
5.	Construction Problem	Easy approach. Less forest Involvement.	Moderate Approach. Moderate forest Involvement. Moderate ROW problems.	Moderate forest Involvement. Moderate ROW problem.
6.	O&M Problem	O & M shall be relatively easier due to better approaches and plain terrain	O & M shall be moderately difficult.	O & M shall be moderately difficult.
7.	Overall Remarks	Easy accessibility less ROW problems & minimum forest involvement.	Easy accessibility but more line length with moderate ROW problems & high forest involvement.	Easy accessibility but moderate ROW problems & forest involvement comparatively more.

Reasons for Selection of Final Route:

From the above comparison of three different Alternatives, it is evident that the **Alternative-I** is the most suitable route as it involves minimum forest area, has relatively less ROW problem and also easily approachable. Hence **Alternative-I** has been found most suitable and selected for detailed survey.



SECTION-V: SCREENING OF POTENTIAL ENVIRONMENTAL IMPACT, EVALUATION AND ITS MANAGEMENT

5.0 IMPACT DUE TO PROJECT LOCATION AND DESIGN

Environmental impact of transmission line projects are not far reaching and are mostly localized to ROW. However, transmission line project has some affects on natural and socio-culture resources. These impacts can be minimized by careful route selection. In order to get latest information and further optimization of route modern survey techniques/tools like GIS, GPS aerial photography are also applied. Introduction of GIS and GPS in route selection result in access to updated/latest information, through satellite images and further optimization of route having minimal environmental impact. Moreover, availability of various details, constraints like topographical and geotechnical details, forest and environmental details etc. help in planning the effective mitigative measures including engineering variations depending upon the site situation/location. In the instant project these techniques are not used. All possible measures have been taken during the finalization of route alignment for the proposed transmission system but due to peculiarity of terrain and demography of the area where project is being implemented, some environmental impacts may be there. The explanations in brief with regard to specific environment review criteria based on preliminary survey are as follows:

(i) Resettlement

As described earlier all measures are undertaken by POWERGRID at line routing stage itself to avoid settlements such as cities, villages etc. It may be seen from the above description of proposed route alignment and also keeping in mind that no land is acquired for tower foundation as per existing law, the project does not require any resettlement of villagers.

The proposed project involves construction of one new substation at Rajarhat and the extension of one existing substations at Purnea, Gokarna, Farakka and Chaibasa. However, fresh land acquisition is only involved for Rajarhat substation. In case of 400/220 KV Rajarhat substation, a land area measuring 12.96 acres belonging to private land owners is being acquired. The social assessment of the allotted land shall be carried out. Based on the assessment, a detailed Rehabilitation Action Plan (RAP) (if required) shall be prepared listing all measures for Rehabilitation of PAPs/encroachers and community development work to be undertaken for up-liftment /improvement of infrastructure etc. of affected village.

(ii) Land value depreciation

Based on past experience land prices are generally expected to rise in the areas receiving power. Further, transmission lines generally pass through un-inhabited area, agriculture fields and forests, where the land-use is not going to change in foreseeable future. Therefore, the value of land will not be adversely affected to a significant degree.



(iii) Historical/cultural monuments/value

As per the POWERGRID's policy of route selection only that route alignment is finalized which avoids all the historical and cultural monuments. As per the preliminary assessment carried out during finalization of route alignment in consultation with State revenue authorities and Archeological Survey of India (ASI), **no such monument is coming in the proposed route alignment.**

(iv) Encroachment into precious ecological areas

As already explained all precautions have been taken to avoid routing of line through forest and ecological sensitive areas and National park/Sanctuaries. However, complete avoidance of forest area was not possible. The routes of proposed transmission line have been finalized in such a way that it affects minimum forest area in consultation with forest department.

In 400 KV D/C Rajarhat-Purnea Line, out of total transmission line length of 439.351 km, about 2.6 km (0.59%) length shall pass through forest land consisting a total of 11.96 Ha. forest area in the state of West Bengal, Jharkhand and Bihar.

In LILO of 400 KV D/C Subashgram-Jeerut at Rajarhat, out of total transmission line length of 4 km, about 0.21 km (5.25%) length shall pass through forest land consisting a total of 1 Ha. forest area in the state of West Bengal

In LILO of 400 KV D/C Purnea-Rajarhat at Farakka, out of total transmission line length of 19.002 km, about 0.21 km (1.1 %) length shall pass through forest land consisting a total of 1 Ha. forest area in the state of West Bengal

In LILO of 400 KV D/C Purnea-Rajarhat at Gokarna, out of total transmission line length of 16.889 km, about 0.21 km (1.24 %) length shall pass through forest land consisting a total of 1 Ha. forest area in the state of West Bengal.

Prior approval of GOI/MOEF shall be obtained for affected forest under Forest (Conservation) Act, 1980 after detail survey and finalization of route through forest area in consultation with local forest authorities. Most of the forests to be traversed by the lines are already degraded and the wildlife species present are those who have been adapted to open or disturbed habitat. Therefore with provision of Compensatory Afforestation the overall forest status will in many cases improve. A budget provision of **Rs. 135.5 lakhs for 400 KV D/C Rajarhat-Purnea Line, Rs. 11.33 lakhs for LILO of 400 KV D/C Subashgram-Jeerut at Rajarhat, Rs. 11.33 for LILO of 400 KV D/C Purnea-Rajarhat at Farakka and Rs. 11.33 lakhs for LILO of 400 KV D/C Purnea-Rajarhat at Gokarna** has been kept in the cost estimate to meet the requirement of Compensatory Afforestation and Net Present Value (NPV). A detail of budget estimate is enclosed as **Annexure-2**.

Nonetheless, to mitigate losses to existing forests, clearing of the transmission line Right-of-way will be done under supervision of Forest Department, and some low canopy seed trees and shrubs may be kept intact if they do not interfere with tower erection and line installation. The wood will be sold by the Forest Department, who will also retain the sale proceeds. Three-meter wide strips of land under each conductor will be cleared and maintained as maintenance rows, but the remaining land will be allowed to regenerate. Lopping of trees to maintain line clearance will be done under the direction of Forest Department. POWERGRID will provide construction crews



with fuel wood or alternative fuels as a precaution against collection of fuel wood from nearby forest.

(v) Encroachment into other valuable lands

Impacts on agricultural land will be restricted to the construction phase and when large-scale maintenance measures are required. Some stretch of the line will pass through agricultural fields. Agricultural land will be lost at the base of the tower, which is estimated to be 0.2-1 sq. m per average farm holding (**Fig-1**).

It is estimated that for **400 KV D/C Rajarhat-Purnea Line of 439.351 Km** a total of 1098 towers will result in loss of approx. 1098 sq.m. or 0.1098 ha. of land. **For LILO of 400 KV D/C Subashgram-Jeerut at Rajarhat (4 kms)** approx 10 towers will result in total loss of approx. 10 sq.m. or 0.0010 ha. of land. **For LILO of 400 KV D/C Purnea-Rajarhat at Farakka (19.002 kms)**, approx 48 towers will result in total loss of approx.48 sq.m. or 0.0048 ha. of land. **For LILO of 400 KV D/C Purnea-Rajarhat at Gokarna (16.889 kms)**, approx 43 towers will result in total loss of approx.43 sq.m. or 0.0043 ha. of land. Therefore, a total land loss estimated to be about 0.1199 Ha, which is negligible and will not adversely affect the land holding.

In areas where lines will traverse agricultural land, compensation will be paid to owners for any crop damage incurred as a result of construction activities. POWERGRID field staff will consult affected villagers and local revenue department and apprise them about the project and tower location, which shall be erected in the agricultural land. Revenue department, after evaluating the loss due to construction activity and productivity of land, will calculate the compensation cost and that will be paid to farmers. Agricultural activities will be allowed to continue following the construction period. If bunds or other on-farm works are disturbed during construction or maintenance, they will be restored to the owner's satisfaction following cessation of construction or maintenance activities. In the event that private trees are felled during construction or maintenance operations, compensation will be paid to the owner in an amount determined by the estimated loss of products from the tree over an eight year period (for fruit bearing trees) and for other trees compensation is finalized in consultation with local forest authorities. Agricultural lands under private ownership will be identified, and in accordance with normal POWERGRID procedures compensation will be paid to the affected villagers (**Annexure-3**). Budgetary provision of **Rs. 436.751 lakhs for 400 KV D/C Rajarhat-Purnea, Rs. 3.79 lakhs for LILO of 400 KV D/C Subashgram-Jeerut at Rajarhat , Rs. 18.792 lakhs for LILO of 400 KV D/C Purnea-Rajarhat at Farakka and Rs. 16.679 lakhs for LILO of 400 KV D/C Purnea-Rajarhat at Gokarna** is made in the cost estimate to meet these expenses.

(vi) Interference with other utilities and traffic

As per regulations enacted by Government of India, it is mandatory for POWERGRID to seek clearance prior to construction from department of Railways, Telecommunications and wherever necessary from aviation authorities that are likely to be affected by the construction of transmission lines. The transmission lines affect nearby telecommunication circuits by causing electrical interference. A standing committee -- Power Telecom Co-ordination Committee (P.T.C.C.) has been constituted by



Government of India to plan and implement the mitigating measures for the induced voltage which may occur to nearby telecom circuit and suggest necessary protection measures to be adopted. The committee suggests measures like rerouting of the telecom circuits, conversion of overhead telecom circuits into cables etc. to minimize the interference.

The cost of such measures is determined by the Committee and is shared by POWERGRID and Telecom Department on the basis of prevailing norms and guidelines. Though the exact cost to mitigate the impacts of induction in neighboring telecom circuits would vary from case to case, the cost on an average works out to be Rs.50000/- per km for POWERGRID. Provision to meet these expenses has been made in the cost estimate for the same.

Wherever transmission line crosses the railways, clearance is taken from that department. In general, the system is planned and executed in such a way that adequate clearance is maintained between transmission lines on the one hand, and railways, civil aviation and defense installations on the other. Wherever the transmission lines pass by the airports the towers beyond specified height are painted in alternate orange and white stripes for easy visibility and warning lights are placed atop these towers.

(vii) Interference with drainage pattern

As the transmission lines are constructed aerially and the blockage of ground surface is limited to area of tower footings, which is very small, there is little possibility of affecting drainage pattern. In the infrequent instances where the drainage is affected, flow will be trained and guided to safe zones.

5.1 ENVIRONMENTAL PROBLEMS DUE TO DESIGN

(i) Escape of polluting materials

The equipments installed on lines and substations are static in nature and do not generate any fumes or waste materials.

(ii) Explosion/fire hazards

During the survey and site selection for transmission lines and sub-stations, it has been ensured that these are kept away from oil/gas pipelines and other sites with potential for creating explosions or fires.

Fires due to flashover from lines can be a more serious problem in forest. However, adequate safety measures shall be taken to avoid such incidence besides this forest authorities also incorporate measures like making fire lines to prevent spreading of fire in the affected forest area.



(iii) Erosion hazards due to inadequate provision for resurfacing of exposed area

Adequate measures are taken to re-surface the area where excavation works are done. Topsoil disturbed during the development of sites will be used to restore the surface of the platform. Infertile and rocky material will be dumped at carefully selected dumping areas and used as fill for tower foundations.

(iv) Environmental aesthetics

Since spacing between the towers is approx. 300-400 meters these will not affect the visual aesthetics of the localities particularly when it is ensured to route the lines as far away from the localities as possible. POWERGRID takes up plantation of trees to buffer the visual effect around its substations and to provide better living conditions. Wherever POWERGRID feels it appropriate, discussions will be held with local Forest Department officials to determine feasibility of planting trees along roads running parallel to transmission lines to buffer visual effect in these areas. In addition, towers may be painted grey or green to merge with the background.

(v) Noise/vibration nuisances

The equipment installed at sub-station are mostly static and are so designed that the noise level always remains within permissible limits i.e. 85 dB as per Indian standards. The noise levels reported during normal operating conditions are about 60 to 70 dB at 2 m. distance from the equipment. To contain the noise level within the permissible limits whenever noise level increases beyond permissible limits, measures like providing sound and vibration dampers and rectification of equipment are undertaken. In addition, plantations of sound absorbing species like Casuarinas, Tamarind, and Neem are raised at the sub-stations that reduce the sound level appreciably. Actual noise levels measured at perimeters of existing Substations are 30 to 40 dB.

(vi) Blockage of wildlife passage

The proposed lines are passing through mostly agricultural, wasteland and forest area. Area is also not a migration path of wildlife hence, possibility of disturbance to wild life area is nil/remote.

5.2 ENVIRONMENTAL PROBLEMS DUE TO CONSTRUCTION PHASE

(i) Uncontrolled silt runoff

The proposed projects involves only small scale excavation for tower foundations at scattered locations that are re-filled with excavated material, therefore uncontrolled silt run off is not expected.

(ii) Nuisance to nearby properties

As already described in preceding paras, during site selection due care is taken to keep the transmission line and substations away from settlements. Further, all the construction activities will be undertaken through the use of small mechanical devices e.g.



tractors and manual labour therefore nuisance to the nearby properties if any, is not expected.

(iii) Interference with utilities and traffic and blockage of access way

Access to the site will be along existing roads or village paths; minor improvements to paths may be made where necessary, but no major construction of roads will be necessary either during construction or as a part of maintenance procedures.

As and when a transmission line crosses any road/ railways line, the terminal towers are located at sufficient distance so as not to cause any hindrance to the movement of traffic. Stringing at the construction stage is carried out during lean traffic period in consultation with the concerned authorities and angle towers are planted to facilitate execution of work in different stages.

(iv) Inadequate resurfacing for erosion control

The proposed lines are to be constructed mostly in plain area where erosion problem is not anticipated. However, if due to terrain at some points transmission towers may be placed on slopes and erosion prone soils internationally accepted engineering practices will be undertaken to prevent soil erosion. This will include cutting and filling slopes wherever necessary. The back cut slopes and downhill slopes will be treated with revetments. As explained above adequate steps shall be taken to resurface the area after construction. Wherever sites are affected by active erosion or landslides, both biological and engineering treatment will be carried out, e.g. provision of breast walls and retaining walls, and sowing soil binding grasses around the site. Furthermore, construction is generally undertaken outside the rainy season. The proposed line is mostly passing through plain area; hence these problems are not anticipated.

(v) Inadequate disposition of borrow area

As mentioned earlier the transmission tower foundations involve excavations on small scale basis and the excavated soil is utilized for back filling. In case of sub-stations generally the sites are selected in such a manner that the volume of cutting is equal to volume of filling avoiding borrowing of the area. Therefore, acquisition/opening of borrow area is not needed.

(vi) Protection of Worker's health/safety

The Safety Regulations/Safety Manual published by POWERGRID and included in tender documents will guide provisions for workers' health and safety. Various aspects such as, work and safety regulations, workmen's compensation, insurance are adequately covered under the General Conditions of Contract (GCC), a part of bidding documents. As a deterrent or to minimize accident during construction a provision in the contract has been added that stipulates a fine/penalty of Rs.10 lakhs for each accidental death and Rs1.0 lakh/each for any injury and is deducted from the contractor's payment and paid to the deceased/affected family, in case of occurrence **(Annexure-4)**.



POWERGRID has a dedicated unit to oversee all health and safety aspects of its project under the Operation Service Department. POWERGRID has framed guidelines/checklist for workers' safety as its personnel are exposed to live EHV apparatus and transmission lines. These guidelines/checklist include work permits and safety precautions for work on the transmission lines both during construction and operation (**Annexure-5**) and is monitored regularly by site in-charge and corporate Operation Services. In addition training is imparted to the workers in fire fighting and safety measures. Safety tools like helmet, safety belt, gloves etc. are provided to them in accordance to the provisions of Safety Manual. First aid facilities will be made available with the labour gangs, and doctors called in from nearby towns when necessary. The number of outside (skilled) labourers will be quite small, of the order of 25-30 people per group. The remaining workforce of unskilled labourers will be comprised of local people. Workers are also covered by the statutory *Workmen (Compensation) Act*. Regular health checkups are conducted for construction workers. The construction sites and construction workers' houses will be disinfected regularly if required. In order to minimize/checking of spread of socially transmitted diseases e.g. HIV/AIDS etc. POWERGRID will conduct awareness building programs on such issues for the construction workers.

5.3 ENVIRONMENTAL PROBLEMS RESULTING FROM OPERATION

(i) O&M Staff/Skills less than acceptable resulting in variety of adverse effects

The O&M program in POWERGRID is normally implemented by sub-station personnel for both, the lines as well as sub-stations. However in respect of the long distance transmission lines there are monitoring offices that are located at various points en-route. Monitoring measures employed include patrolling and thermo-vision scanning.

The supervisors and managers entrusted with O&M responsibilities are intensively trained for necessary skills and expertise for handling these aspects.

A monthly preventive maintenance program will be carried out to disclose problems related to cooling oil, gaskets, circuit breakers, vibration measurements, contact resistance, condensers, air handling units, electrical panels and compressors. Any sign of soil erosion is also reported and rectified. Monitoring results are published monthly, including a report of corrective action taken and a schedule for future action.

POWERGRID is following the approved international standards and design, which are absolutely safe. Based on the studies carried out by different countries on the safety of EHV lines in reference to EMF affect POWERGRID have also carried out such studies with the help of PTI, **USA** and **CPRI, Bangalore** on their design. The studies inferred that the POWERGRID design are safe and follow the required international standard. Because of issues relating to need to ensure health and safety relating to the line such as fire safety, safe voltages on metallic parts of buildings, and safety clearances to avoid flashover, the transmission lines will not pass directly over any residential properties and as such the potential for EMF effects to occur will be further diminished. Given that it will be necessary to ensure that there are no properties in the ROW beneath and to the sides of the overhead line, automatic mitigation against EMF will be provided between the source of potentially high strengths (the transmission line) and the residential properties.



Poly Chlorinated Biphenyls (PCBs) due to its high heat capacity, low flammability and low electrical conductivity was extensively used as insulating material in capacitors and transformers. But after the finding that these PCBs are non-biodegradable and has carcinogenic tendency, its use in electrical equipments as insulating medium has been banned all over the world long back. However, it has been reported in some studies that chances of contamination of oil with PCB is possible. Keeping that in mind, POWERGRID has taken all possible steps in association with NGC, UK and setup Regional testing laboratories for testing of existing oil for PCB traces and results of this suggests that PCB contamination is not an issue with POWERGRID. The World Bank has also made following comments after a detailed study on Management of PCBs in India:

“Power Grid was the most advanced in testing for PCBs of the organizations visited for this project. They have established a procedure for identification of the presence of PCBs in transformer oil and more detailed analysis for positive identification sample. To date no significant concentrations of PCBs have been detected. Power Grid does not appear to have any significant issues regarding PCB management and have initiated a testing program. The experience & laboratories of Power Grid could be used to provide a national PCB auditing service”.

5.4 CRITICAL ENVIRONMENTAL REVIEW CRITERIA

(i) Loss of irreplaceable resources

The transmission projects do not involve any large scale excavation and land is lost to the extent of 0.2-1 sq m only for each foundation. As only **0.59% of the total length of the 400 KV D/C Rajarhat-Purnea, 5.25% of the total length of the LILO of 400 KV D/C Subashgram-Jeerut at Rajarhat, 1.1% of the total length of the LILO of 400 KV D/C Purnea-Rajarhat at Farakka and 1.24% of the total length of the LILO of 400 KV D/C Purnea-Rajarhat at Gokarna** in the subject projects are passing through forest area and the said forest is degraded, the problem of losing natural resources in these project are insignificant. Moreover, with the provision of raising compensatory afforestation on double the area getting affected will increase the forest cover.

(ii) Accelerated use of resources for short-term gains

The proposed project will not be making use of any natural resources occurring in the area during construction as well as maintenance phases. The construction material such as tower members, cement etc shall come from factories while the excavated soil shall be used for backfilling to restore the surface. Thus the project shall not cause any accelerated use of resources for short term gains.

(iii) Endangering of species

No endangered species of flora and fauna exist in these project areas. Thus there is no possibility of endangering/causing extinction of any species.



(iv) Promoting undesirable rural-to urban migration

The proposed project will not cause any submergence or loss of land holdings that normally trigger migration. It also does not involve acquisition of any private land holdings. Hence, there is no possibility of any migration.

5.5 PUBLIC CONSULTATION

Public consultation/information is an integral part of the project implementation. Public is informed about the project at every stage of execution. During survey also POWERGRID's site officials meet people and inform them about the routing of transmission lines. During the construction, every individual, on whose land tower is erected and people affected by ROW, are consulted.

Apart from this, public consultation using different technique like Public Meeting, Small Group Meeting, informal Meeting as per **Environmental Social Policy & Procedures of POWERGRID (ESPP)** shall also be carried out during different activities of project cycle. During such consultation the public will be informed about the project in general and in particular about the following:

- Complete project plan (i.e. its route and terminating point and substations, if any, in between);
- POWERGRID design standards in relation to approved international standards;
- Health impacts in relation to EMF;
- Measures taken to avoid public utilities such as school, hospitals, etc.;
- Other impacts associated with transmission lines and POWERGRID's approach to minimizing and solving them;
- Land acquisition details, proposed R&R measures and compensation packages in line with POWERGRID's policy;
- Trees and crop compensation process.

Apart from organizing many informal group meetings in different villages, public meetings were also organized in the routes of transmission lines (**Table 5.1**). To get the maximum participation during the Public Consultation Program, a notice was served well in advance to the villagers are enclosed. The details of lines and its importance were explained to the villagers. Villagers including Village Panchayat representatives and POWERGRID representative participated in the program. The detail of public Consultation program is enclosed as **Annexure-6**. The photographs are enclosed as **Plate-A**. The program was arranged in an interactive way and queries like crop compensation, route alignment etc. were replied. Most of the participants were small farmers and were worried about their land through which the line will pass. They were informed that POWERGRID will not acquire their land for construction of transmission lines. Only towers will be spotted in their fields where they can do farming without any fear because the tower height is very high and even tractor can pass below the tower. Moreover, there is no risk of passing current from the above line as there is foolproof system of earthing for tower. The consultation process was appreciated by the villagers. They were happy to know about the transparent policy of POWERGRID for execution of the project and promised to extend their cooperation during construction of the line. The



process of such consultation and its documentation shall continue during project implementation and even during O&M stage.

Table - 5.1
Details of Public Consultation en-route of proposed Transmission Lines

Sl. No.	Date of meeting	No. of villagers attended	Name of Village	Remarks
1.	14.05.13	12	Tona	Village Panchayat representatives, farmers, teachers and others attended the meeting. Compensation for Crops/trees, were main concerns which were clarified during meeting.
2.	28.05.13	15	Sabdapur	
3.	31.05.13	11	Subarnapur	
4.	06.06.13	13	Josahari	
5.	13.06.13	12	Tarapur	
6.	13.06.13	13	Tatla-I	
7.	08.06.13	19	Rotora	
8.	08.06.13	17	Singhia	
9.	23.07.13	20	Gokarna	

5.6 CONCLUSION

From the above discussion, it seems that the area is rich in physical resources. But careful route selection has minimized involvement of forest area to the extent possible but could not be completely avoided due to terrain and other physiographical reasons. Thus, routes selected for detailed survey are the most optimum alignment and involved minimum forest. No major impact on wild life is envisaged as the forest is not the habitat of any endangered or endemic species of fauna and flora. The infrastructural constraints are very real and pose a limiting factor on the development of the area. The above facts while on the one hand underline the need for implementation of the project for overall development of the area and on another hand suggest that a detailed E.I.A. may not be necessary.



SECTION-VI: MONITORING AND ORGANISATIONAL SUPPORT STRUCTURE

6.0 ENVIRONMENTAL MONITORING PROGRAM IN POWERGRID

Monitoring is a continuous process for POWERGRID projects at all the stages be it the site selection, construction or maintenance.

The success of POWERGRID lies in its strong monitoring systems. Apart from the site managers reviewing the progress on daily basis, regular project review meetings are held at least on monthly basis, which is chaired by Executive Director of the region wherein apart from construction issues the environmental aspects of the projects are discussed, and remedial measures taken wherever required. The exceptions of these meetings are submitted to the Directors and Chairman and Managing Director of the Corporation. The progress of various on-going projects is also informed to the Board of Directors. Following is the organization support system for proper implementation and monitoring of Environmental & Social Management Plan.

6.1 CORPORATE LEVEL

An Environmental Management Cell at corporate level was created within POWERGRID in 1992 and subsequently upgraded to an Environment Management Department (EMD) in 1993 and in 1997 it has been further upgraded to Environment & Social Management Deptt. (ESMD) by incorporating social aspect of project. Briefly, the ESMD's responsibilities are as follows:

- Advising and coordinating RHQs and Site to carry out environmental and social surveys for new projects.
- Assisting RHQs and site to finalize routes of entire power transmission line considering environmental and social factors that could arise en-route
- Help RHQs and Site to follow-up with the state forest offices and other state departments in expediting forest clearances and the land acquisition process of various ongoing and new projects
- Act as a focal point for interaction with the MoEF for expediting forest clearances and follow-ups with the Ministry of Power.
- Imparts training to POWERGRID's RHQs & Site Officials on environment and social issues and their management plan.

6.2 REGIONAL LEVEL

At its Regional Office POWERGRID has an Environmental and Social Management cell (ESMC) to manage Environmental and Social issues and to coordinate between ESMD at the corporate level and the Construction Area Office (CAO) of site. The key functions envisaged for ESCM are:



- Advising and coordinating field offices to carry out environmental and social surveys for new projects envisaged in the Corporate Investment Plan
- Assisting the ESMD and CAOs to finalize routes of entire power transmission lines considering the environmental and social factors that could arise en-route
- To follow-up forest clearances and land acquisition processes with state forest offices and other state departments for various ongoing and new projects
- Acting as a focal point for interaction with the ESMD and CAOs on various environmental and social aspects.

6.3 SITE OFFICE

At the Construction Area office (CAO) level, POWERGRID has made the head of the site responsible for implementing the Environmental and Social aspect of project and are termed as Environmental and Social Management Team (ESMT). Key functions of the ESMT are:

- Conduct surveys on environmental and social aspects to finalize the route for the power transmission projects
- Conduct surveys for the sites to be considered for land acquisition
- Interact with the Forest Departments to make the forest proposal and follow it up for MoEF clearance.
- Interact with Revenue Authorities for land acquisition and follow it up with Authorized Agencies for implementation of Social Management Plan (SMP).
- Implementation of Environment Management Plan (EMP) and SMP
- Monitoring of EMP and SMP and producing periodic reports on the same.

It may be noted that POWERGRID is well equipped to implement and monitor its environment and Social Management plans.

As regards monitoring of impacts on ecological resources particularly in Forest, Sanctuary or National Park, it is generally done by the concerned Divisional Forest Officer, Chief Wildlife Warden and their staff as a part of their normal duties. A detailed **Environment Management Plan (EMP)** including monitoring plan for all possible environmental and social impact and its proper management has been drawn (**Table-6.1**) and will be implemented during various stage of project execution. Since many provisions of EMP are to be implemented by contractor hence for proper monitoring EMP has included in the contract document.

6.4 ENVIRONMENTAL REVIEW

Periodic review by corporate ESMD and higher management including review by CMD POWERGRID of all environmental and social issues is under taken to ensure that EMP and other measures are implemented at site.



Table- 6.1 Environment Management Plan

Project activity /stage	Potential impact	Proposed mitigation measure	Parameter to be monitored	Measurement and frequency	Institutional responsibility	Implementation schedule
Pre-construction						
Location of transmission towers and transmission line alignment and design	Exposure to safety related risks	Setback of dwellings to overhead line route designed in accordance with permitted level of power frequency and the regulation of supervision at sites.	Tower location and line alignment selection with respect to nearest dwellings	Setback distances to nearest houses - once	POWERGRID	Part of tower siting survey and detailed alignment survey and design
Equipment specifications and design parameters	Release of chemicals and gases in receptors (air, water, land)	PCBs not used in substation transformers or other project facilities or equipment.	Transformer design	Exclusion of PCBs in transformers stated in tender specification – once	POWERGRID	Part of tender specifications for the equipment
		Processes, equipment and systems not to use chlorofluorocarbons (CFCs), including halon, and their use, if any, in existing processes and systems should be phased out and to be disposed of in a manner consistent with the requirements of the Government	Process, equipment and system design	Exclusion of CFCs stated in tender specification – once	POWERGRID	Part of tender specifications for the equipment
				Phase out schedule to be prepared in case still in use – once		
Transmission line design	Exposure to electromagnetic interference	Transmission line design to comply with the limits of electromagnetic interference from overhead power lines	Electromagnetic field strength for proposed line design	Line design compliance with relevant standards – once	POWERGRID	Part of detailed alignment survey and design



Project activity /stage	Potential impact	Proposed mitigation measure	Parameter to be monitored	Measurement and frequency	Institutional responsibility	Implementation schedule
Location of transmission towers and transmission line alignment and design	Impact on water bodies and land Social inequities	Consideration of tower location at where they could be located to avoid water bodies or agricultural land.	Tower location and line alignment selection (distance to water and/or agricultural land)	Consultation with local authorities and land owners – once	POWERGRID	Part of tower siting survey and detailed alignment survey and design
		Careful route selection to avoid existing settlements	Tower location and line alignment selection (distance to nearest dwellings or social institutions)	Consultation with local authorities and land owners – once		Part of detailed tower siting and alignment survey and design
		Minimise need to acquire agricultural land	Tower location and line alignment selection (distance to agricultural land)	Consultation with local authorities and land owners – once		Part of detailed tower siting and alignment survey and design
Encroachment into precious ecological areas	Loss of precious ecological values/ damage to precious species	Avoid encroachment by careful site and alignment selection	Tower location and line alignment selection (distance to nearest designated ecological protection area)	Consultation with local forest authorities – once	POWERGRID	Part of detailed siting and alignment survey /design
Transmission line through forestland	Deforestation and loss of biodiversity	Avoid encroachment by careful site and alignment selection	Tower location and line alignment selection (distance to nearest protected or reserved forest)	Consultation with local authorities – once	POWERGRID	Part of detailed siting and alignment survey/design
		Minimise the need by using existing towers, tall towers and RoW, wherever possible		Consultation with local authorities and design engineers – once		
		Obtain statutory clearances from the Government	Statutory approvals from Government	Compliance with regulations – once for each subproject		



Project activity /stage	Potential impact	Proposed mitigation measure	Parameter to be monitored	Measurement and frequency	Institutional responsibility	Implementation schedule
Encroachment into farmland	Loss of agricultural productivity	Use existing tower footings/towers wherever possible	Tower location and line alignment selection	Consultation with local authorities and design engineers - once	POWERGRID	Part of detailed alignment survey and design
		Avoid siting new towers on farmland wherever feasible	Tower location and line alignment selection	Consultation with local authorities and design engineers - once		Part of detailed siting and alignment survey /design
		Farmers compensated for any permanent loss of productive land	Design of Implementation of Crop Compensation (based on affected area)	Consultation with affected parties – once in a quarter		Prior to construction phase
		Farmers/landowners compensated for significant trees that need to be trimmed/ removed along RoW.	Design of Implementation of Tree compensation (estimated area to be trimmed/removed)	Consultation with affected parties – once in a quarter		Prior to construction phase
			Statutory approvals for tree trimming /removal	Compliance with regulations – once for each subproject		Part of detailed siting and alignment survey /design
Interference with drainage patterns/Irrigation channels	Flooding hazards/loss of agricultural production	Appropriate siting of towers to avoid channel interference	Tower location and line alignment selection (distance to nearest flood zone)	Consultation with local authorities and design engineers - once	POWERGRID	Part of detailed alignment survey and design



Project activity /stage	Potential impact	Proposed mitigation measure	Parameter to be monitored	Measurement and frequency	Institutional responsibility	Implementation schedule
Escape of polluting materials	Environmental pollution	Transformers designed with oil spill containment systems, and purpose-built oil, lubricant and fuel storage system, complete with spill cleanup equipment.	Equipment specifications with respect to potential pollutants	Tender document to mention specifications - once	POWERGRID	Part of detailed equipment design /drawings
Construction						
Equipment layout and installation	Noise and vibrations	Construction techniques and machinery selection seeking to minimize ground disturbance.	Construction techniques and machinery	Construction techniques and machinery creating minimal ground disturbance - once at the start of each construction phase	POWERGRID (Contractor through contract provisions)	Construction period
Physical construction	Disturbed farming activity	Construction activities on cropping land timed to avoid disturbance of field crops (within one month of harvest wherever possible).	Timing of start of construction	Crop disturbance – Post harvest as soon as possible but before next crop - once per site	POWERGRID (Contractor through contract provisions)	Construction period
Mechanized construction	Noise, vibration and operator safety, efficient operation	Construction equipment to be well maintained.	Construction equipment – estimated noise emissions	Complaints received by local authorities - every 2 weeks	POWERGRID (Contractor through contract provisions)	Construction period
	Noise, vibration, equipment wear and tear	Turning off plant not in use.	Construction equipment – estimated noise emissions and operating schedules	Complaints received by local authorities - every 2 weeks	POWERGRID (Contractor through contract provisions)	Construction period



Project activity /stage	Potential impact	Proposed mitigation measure	Parameter to be monitored	Measurement and frequency	Institutional responsibility	Implementation schedule
Construction of roads for accessibility	Increase in airborne dust particles	Existing roads and tracks used for construction and maintenance access to the line wherever possible.	Access roads, routes (length and width of new access roads to be constructed)	Use of established roads wherever possible - every 2 weeks	POWERGRID (Contractor through contract provisions)	Construction period
	Increased land requirement for temporary accessibility	New access ways restricted to a single carriageway width within the RoW.	Access width (meters)	Access restricted to single carriageway width within RoW - every 2 weeks	POWERGRID (Contractor through contract provisions)	Construction period
Temporary blockage of utilities	Overflows, reduced discharge	Temporary placement of fill in drains/canals not permitted.	Temporary fill placement (m ³)	Absence of fill in sensitive drainage areas - every 4 weeks	POWERGRID (Contractor through contract provisions)	Construction period
Site clearance	Vegetation	Marking of vegetation to be removed prior to clearance, and strict control on clearing activities to ensure minimal clearance.	Vegetation marking and clearance control (area in m ²)	Clearance strictly limited to target vegetation - every 2 weeks	POWERGRID (Contractor through contract provisions)	Construction period
Trimming/cutting of trees within RoW	Fire hazards	Trees allowed growing up to a height within the RoW by maintaining adequate clearance between the top of tree and the conductor as per the regulations.	Species-specific tree retention as approved by statutory authorities (average and maximum tree height at maturity, in meters)	Presence of target species in RoW following vegetation clearance – once per site	POWERGRID (Contractor through contract provisions)	Construction period
	Loss of vegetation and deforestation	Trees that can survive pruning to comply should be pruned instead of cleared.	Species-specific tree retention as approved by statutory authorities	Presence of target species in RoW following vegetation clearance – once per site	POWERGRID (Contractor through contract provisions)	Construction period



Project activity /stage	Potential impact	Proposed mitigation measure	Parameter to be monitored	Measurement and frequency	Institutional responsibility	Implementation schedule
		Felled trees and other cleared or pruned vegetation to be disposed of as authorized by the statutory bodies.	Disposal of cleared vegetation as approved by the statutory authorities (area cleared in m ²)	Use or intended use of vegetation as approved by the statutory authorities – once per site	POWERGRID (Contractor through contract provisions)	Construction period
Wood/vegetation harvesting	Loss of vegetation and deforestation	Construction workers prohibited from harvesting wood in the project area during their employment, (apart from locally employed staff continuing current legal activities).	Illegal wood /vegetation harvesting (area in m ² , number of incidents reported)	Complaints by local people or other evidence of illegal harvesting - every 2 weeks	POWERGRID (Contractor through contract provisions)	Construction period
Surplus earthwork/soil	Runoff to cause water pollution, solid waste disposal	Soil excavated from tower footings disposed of by placement along roadsides, or at nearby house blocks if requested by landowners.	Soil disposal locations and volume (m ³)	Acceptable soil disposal sites - every 2 weeks	POWER GRID (Contractor through contract provisions)	Construction period
Site clearance	Vegetation	Tree clearances for easement establishment to only involve cutting trees off at ground level or pruning as appropriate, with tree stumps and roots left in place and ground cover left undisturbed.	Ground disturbance during vegetation clearance (area, m ²)	Amount of ground disturbance - every 4 weeks	POWERGRID (Contractor through contract provisions)	Construction period
			Statutory approvals	Statutory approvals for tree clearances – once for each site	POWERGRID (Contractor through contract provisions)	Construction period
Tower construction – disposal of surplus earthwork/fill	Waste disposal	Excess fill from tower foundation excavation disposed of next to roads or around houses, in agreement with the local community or landowner.	Location and amount (m ³) of fill disposal	Appropriate fill disposal locations - every 2 weeks	POWERGRID (Contractor through contract provisions)	Construction period
Storage of chemicals and	Contamination of receptors	Fuel and other hazardous materials securely stored	Location of hazardous material storage; spill	Fuel storage in appropriate	POWERGRID (Contractor	Construction period



Project activity /stage	Potential impact	Proposed mitigation measure	Parameter to be monitored	Measurement and frequency	Institutional responsibility	Implementation schedule
materials	(land, water, air)	above high flood level.	reports (type of material spilled amount (kg or m ³) and action taken to control and clean up spill)	locations and receptacles - every 2 weeks	through contract provisions)	
Construction schedules	Noise nuisance to neighbouring properties	Construction activities only undertaken during the day and local communities informed of the construction schedule.	Timing of construction (noise emissions, [dB(A)])	Daytime construction only - every 2 weeks	POWERGRID (Contractor through contract provisions)	Construction period
Provision of facilities for construction workers	Contamination of receptors (land, water, air)	Construction workforce facilities to include proper sanitation, water supply and waste disposal facilities.	Amenities for Workforce facilities	Presence of proper sanitation, water supply and waste disposal facilities - once each new facility	POWERGRID (Contractor through contract provisions)	Construction period
Encroachment into farmland	Loss of agricultural productivity	Use existing access roads wherever possible	Usage of existing utilities	Complaints received by local people /authorities - every 4 weeks	POWERGRID (Contractor through contract provisions)	Construction period
		Ensure existing irrigation facilities are maintained in working condition	Status of existing facilities			
		Protect /preserve topsoil and reinstate after construction completed	Status of facilities (earthwork in m ³)			
		Repair /reinststate damaged bunds etc after construction completed	Status of facilities (earthwork in m ³)			
	Social inequities	Compensation for temporary loss in agricultural production	Implementation of Crop compensation (amount paid, dates, etc.)	Consultation with affected parties – once in a quarter	POWERGRID	Prior to construction
Uncontrolled erosion/silt runoff	Soil loss, downstream siltation;	Need for access tracks minimised, use of existing roads.	Design basis and construction procedures (suspended solids in receiving waters;	Incorporating good design and construction management	POWERGRID (Contractor through contract provisions)	Construction period
		Limit site clearing to work areas				



Project activity /stage	Potential impact	Proposed mitigation measure	Parameter to be monitored	Measurement and frequency	Institutional responsibility	Implementation schedule
		Regeneration of vegetation to stabilise works areas on completion (where applicable)	area re-vegetated in m ² ; amount of bunds constructed [length in meter, area in m ² , or volume in m ³]	practices – once for each site		
		Avoidance of excavation in wet season				
		Water courses protected from siltation through use of bunds and sediment ponds				
Nuisance to nearby properties	Losses to neighbouring land uses/values	Contract clauses specifying careful construction practices.	Contract clauses	Incorporating good construction management practices – once for each site	POWERGRID (Contractor through contract provisions)	Construction period
		As much as possible existing access ways will be used.	Design basis and layout	Incorporating good design engineering practices – once for each site		
		Productive land will be reinstated following completion of construction	Reinstatement of land status (area affected, m ²)	Consultation with affected parties – twice – immediately after completion of construction and after the first harvest		
	Social inequities	Compensation will be paid for loss of production, if any.	Implementation of Tree/Crop compensation (amount paid)	Consultation with affected parties – once in a quarter	POWERGRID	Prior to construction
Inadequate siting of borrow areas	Loss of land values	Existing borrow sites will be used to source aggregates, therefore, no	Contract clauses	Incorporating good construction	POWERGRID (Contractor through	Construction period



Project activity /stage	Potential impact	Proposed mitigation measure	Parameter to be monitored	Measurement and frequency	Institutional responsibility	Implementation schedule
		need to develop new sources of aggregates		management practices– once for each site	contract provisions)	
Health and safety	Injury and sickness of workers and members of the public	Contract provisions specifying minimum requirements for construction camps	Contract clauses (number of incidents and total lost-work days caused by injuries and sickness)	Contract clauses compliance – once every quarter	POWERGRID (Contractor through contract provisions)	Construction period
		Contractor to prepare and implement a health and safety plan.				
		Contractor to arrange for health and safety training sessions				
Inadequate construction stage monitoring	Likely to maximise damages	Training of POWERGRID environmental monitoring personnel	Training schedules	Number of programs attended by each person – once a year	POWERGRID	Routinely throughout construction period
		Implementation of effective environmental monitoring and reporting system using checklist of all contractual environmental requirements	Respective contract checklists and remedial actions taken thereof.	Submission of duly completed checklists of all contracts for each site - once		
		Appropriate contact clauses to ensure satisfactory implementation of contractual environmental mitigation measures.	Compliance report related to environmental aspects for the contract	Submission of duly completed compliance report for each contract - once		
Operation and Maintenance						
Location of transmission towers and transmission line alignment and	Exposure to safety related risks	Setback of dwellings to overhead line route designed in accordance with permitted level of power frequency and the	Compliance with setback distances (“as-built” diagrams)	Setback distances to nearest houses – once in quarter	POWERGRID	During operations



Project activity /stage	Potential impact	Proposed mitigation measure	Parameter to be monitored	Measurement and frequency	Institutional responsibility	Implementation schedule
design		regulation of supervision at sites.				
Inadequate provision of staff/workers health and safety during operations	Injury and sickness of staff /workers	Careful design using appropriate technologies to minimise hazards	Usage of appropriate technologies (lost work days due to illness and injuries)	Preparedness level for using these technologies in crisis – once each year	POWERGRID	Design and operation
		Safety awareness raising for staff.	Training/awareness programs and mock drills	Number of programs and percent of staff /workers covered – once each year		
		Preparation of fire emergency action plan and training given to staff on implementing emergency action plan				
		Provide adequate sanitation and water supply facilities	Provision of facilities	Complaints received from staff /workers every 2 weeks		
Electric Shock Hazards	Injury/mortality to staff and public	Careful design using appropriate technologies to minimise hazards	Usage of appropriate technologies (number of injury incidents, lost work days)	Preparedness level for using these technologies in crisis – once a month	POWERGRID	Design and Operation
		Barriers to prevent climbing on/dismantling of transmission towers	Maintenance of barriers	Report on maintenance – every 2 weeks		
		Appropriate warning signs on facilities	Maintenance of warning signs			
		Electricity safety awareness raising in project areas	Training /awareness programs and mock drills for all concerned parties	Number of programs and percent of total persons covered – once each year		



Project activity /stage	Potential impact	Proposed mitigation measure	Parameter to be monitored	Measurement and frequency	Institutional responsibility	Implementation schedule
Operations and maintenance staff skills less than acceptable	Unnecessary environmental losses of various types	Adequate training in O&M to all relevant staff of substations and transmission line maintenance crews.	Training/awareness programs and mock drills for all relevant staff	Number of programs and percent of staff covered – once each year	POWERGRID	Operation
		Preparation and training in the use of O&M manuals and standard operating practices.				
Inadequate periodic environmental monitoring.	Diminished ecological and social values.	Power Grid staff to receive training in environmental monitoring of project operations and maintenance activities.	Training/awareness programs and mock drills for all relevant staff	Number of programs and percent of staff covered – once each year	POWERGRID	Operation
Equipment specifications and design parameters	Release of chemicals and gases in receptors (air, water, land)	Processes, equipment and systems using cholofluorocarbons (CFCs), including halon, should be phased out and to be disposed of in a manner consistent with the requirements of the Government.	Process, equipment and system design	Phase out schedule to be prepared in case still in use – once in a quarter	POWERGRID	Operations
Transmission line maintenance	Exposure to electromagnetic interference	Transmission line design to comply with the limits of electromagnetic interference from overhead power lines	Required ground clearance (meters)	Ground clearance - once	POWERGRID	Operations